CLAIMS

We claim:

1. A process for manufacturing a seal having a central longitudinal axis and forming a seal between interior and exterior volumes when held under compression between opposed first and second parallel faces of respective first and second flanges, comprising:

cold forming an annular first seal layer; and

applying a second layer to a first surface of the first layer,

wherein the second layer has a higher resistance to stress relaxation than does the first layer at a target operating temperature in excess of 900°C.

2. The process of claim 1 wherein the applying comprises gradually building up the second layer.

3. The process of claim 1 wherein the applying directly adheres the second layer to the first layer.

4. The process of claim 1 wherein the applying adheres the second layer to the first layer along an entirety of at least one of said first surface of the first layer and an adjacent surface of the second layer.

5. The process of claim 1 wherein:

each of the first and second layers provides at least 10% of the radial span of a radial cross-section of the seal along a majority of a length thereof; and

each of the first and second layers provides at least 10% of the local longitudinal compressive strength of the seal along a major portion of the length thereof.

6. The process of claim 1 wherein the first layer consists essentially of a nickel- or cobalt-based superalloy.

7. The process of claim 1 wherein the target operating temperature is about 1600°F (871°C) to 2000°F (1093°C).

8. The process of claim 1 wherein:

the first layer consists essentially of a first nickel-based superalloy; and

the second layer consists essentially of a cast γ' hardened second nickel-based superalloy.

9. The process of claim 1 wherein the second layer extends continuously between first and second portions positioned for contacting the first and second faces and the first layer extends continuously between first and second portions respectively positioned longitudinally inward of said second layer first and second portions.

10. The process of claim 1 wherein the cold forming forms the first layer with a radial cross-section of bellows-like structure.

11. A process for manufacturing a seal for sealing between interior and exterior volumes when held under compression, comprising:

cold forming an annular first seal layer; and

applying a second layer to a first surface of the second layer via a process selected from the group consisting of:

thermal spray of molten alloy droplets and powder;

thermal spray of creep resistant alloys with ceramic particles;

vapor deposition;

slurry coating of ceramics and curing at elevated temperatures;

electroforming of high temperature alloys; and

combinations thereof.

12. The process of claim 11 wherein:

the first layer is formed having a bellows-like section prior to the application of the second layer; and

after the application of the second layer, there is no machining step which removes a portion of the applied second layer material.

13. The process of claim 12 wherein the step of cold forming comprises one of:

cutting an annulus from a tube and deforming the annulus to provide a radial section of enhanced compressibility;

forming and welding a strip into an annulus and deforming the annulus to provide a

radial section of enhanced compressibility; and

deforming a flat strip to provide a section of enhanced compressibility and further deforming and welding the strip to provide an annulus having a radial section of enhanced compressibility.

14. A process for manufacturing a seal having a central longitudinal axis and forming a seal between interior and exterior volumes when held under compression between opposed first and second parallel faces of respective first and second flanges, comprising:

cold forming an annular first seal layer form a refractory material; and

applying an oxidation resistant coating to the first layer.

15. The process of claim 14 wherein the coating entirely covers the first seal layer.

16. The process of claim 14 wherein the coating comprises at least one of molybdenum disilicide and nickel aluminide and is formed by a process including the acts of slurry coating of at least one component of the coating and baking.

17. A process for manufacturing an article, comprising:

cold forming a substrate from a first nickel- or cobalt-based superalloy; and

applying a coating of a γ' hardened second nickel-based superalloy to the substrate.

18. The process of claim 17 wherein the application is via thermal spray process and provides the coating having a thickness of at least 10% of a thickness of the substrate.

19. The process of claim 17 wherein the article has a creep resistance at 982°C greater than a cold formed article of like dimensions consisting essentially of the first superalloy.

20. The process of claim 17 wherein said substrate is formed from said first nickel-based superalloy.